**Goal 2: Create innovative STEM curriculum through pre-service and in service teacher training in critical thinking and problem solving.**

Thesecond goal identified as a key area in development and implementation of STEM curriculum is the training of both pre-service and service teachers in critical thinking and problem solving skills. A recommendation from the President’s Council of Advisors on Science and Technology (2010) provides the following directive:

At the middle and high school levels, the Federal Government should set a goal of ensuring the recruitment, preparation, and induction support of at least 100,000 new STEM teachers over the next decade from programs that are (i) designed to produce teachers who have strong majors in STEM fields and strong content-specific pedagogical preparation – including teachers from nontraditional backgrounds who help diversify the STEM teaching force – and (ii) capable of measuring both the student achievement and the retention of the teachers they produce. (p. 65)

Also, according to the President’s Council “Students need opportunities to establish deeper engagement with and to learn science and mathematics in non-standard, personal, and team-oriented ways that extend beyond the curriculum and the classroom” (p. 88). To reach these mandates and to produce teachers who have both the content knowledge and the skills to infuse that content with hands-on learning experiences in the areas of STEM education, several objectives have been identified as crucial. The principal objectives of the goal of creating innovative STEM curriculum through pre-service and in service teacher training in critical thing and problem solving are:

2.1 to provide pre-service teachers with training in a hands-on STEM curriculum and pedagogy which would give them the knowledge of how to employ these strategies in their future classrooms;

2.2 to provide service teachers with professional development where they would learn how to utilize a hands-on STEM curriculum in their classrooms

2.3 to provide local elementary, middle, and high school students the opportunity make use of critical thinking and problem solving skills outside of the classroom environment;

2.4 to create a hands-on STEM environment where local students (preK-grade 2) are able to learn STEM through inquiry based activities;

2.5 to host an International STEM Summit during the summer months.

The National Science Foundation in its recommendation to President Obama’s administration stated, “Dedicated, high quality teachers are central to ensuring high quality STEM education for all students” (p.2). The University of West Alabama (UWA) shares this belief and seeks to provide a high quality education infused with innovative ideas for STEM education for its pre-service teachers and professional development opportunities for the local in service teachers. To meet the overarching goal and objective 2.1, pre-service teachers of all grade levels (elementary, middle, and high school) will be trained in the use of hands-on and technology based activities which will focus on teaching critical thinking and problem solving skills in the content areas of math and science during their teaching methods courses. In order to accomplish this objective, an upgrade to an existing science laboratory is needed so that it includes all of the equipment and supplies required to teach hands-on, technology-based math, science, and engineering lessons. Some examples of equipment and supplies which foster hands-on, project based learning include microscopes, hand-held data collectors, hands-on science kits, math manipulatives, etc. This lab will provide the future STEM teachers with the opportunity to see innovative STEM teaching and to practice their skills during their pre-service years at UWA.

To provide continued professional development for local in service teachers (2.2) and to offer local students an opportunity to participate in STEM education outside of the classroom (2.3) are essential components for inspiring both teachers and students. UWA seeks to offer a STEM summer enrichment program (Name) which will include two distinct phases. Phase 1 will be a week-long summer camp planned for the professional development of current service teachers in order to train them to incorporate critical thinking and problem solving skills in the classroom and to ensure a solid foundation in hands-on STEM activities. In order to promote the use of hands-on, technology-based lesson, teachers need on-going training so that they can become more comfortable and so that they can see first-hand the benefit of using these methods to encourage student critical thinking and problem solving. Once the teachers have completed Phase 1, Phase 2 of the program will begin. Phase 2 of the summer education program will be a STEM camp for students of all grade levels taught by the service teachers trained in Phase 1 in conjunction with UWA College of Education faculty, Presidential Awardees for Math and Science Teaching, and members of the professional community. Three groups elementary (grades 3-5), middle (grades 6-8), and high school students (grades 9-12) from the surrounding area , will be invited to participate in a week long summer camp where science, technology, engineering, and math will be integrated and taught along a theme. Possible themes include robotics, forensics, environmental awareness, flight, and bridge design????? The week would conclude with a major project culmination such as a robotics contest, solving a crime, building a water purification system, model airplane flight competition or bridge design contest.????.

Younger children should also be inspired by the marvels of science, technology, engineering and math while at the curious stage of life. The President’s Council (2010) stated:

STEM education should build on the proclivities of young people to think carefully about profound issues, solve problems that pose risk to human societies, create and fix mechanical objects, observe or understand phenomena that no one has observed or understood before, probe the behaviors of people, or any of a wide variety of other activities. (p.87)

To achieve objective 2.4 where younger children can experience hands-on STEM activities to stimulate their interest in the areas of science, math, and engineering, UWA wishes to create a STEM classroom specifically designed to foster the natural curiosity of younger children. The theme of the classroom would change each semester in order to keep the learning fresh and exciting. Local teachers would be invited to bring their classes to campus for activities specifically designed to inspire younger children. An example of one possible theme is “Do It Design” where materials such as Legos, Knex, and blocks would be provided so that the children could build their own bridges, houses, stores, cities, etc. The program would be led by one of the project members; however, local PreK-grade 2 teachers would be taught the program through a professional development workshop so that they would be the ones actually teaching the children. Assistance would be provided by ???

The final objective (2.5), to hold an International Summit during the summer months, will aid in reaching the goal of creating innovative STEM curriculum through pre-service and in service teacher training in critical thinking and problem solving by affording the local teaching community (pre-service and service) the opportunity to interact with and learn from globally renowned educators. Members of the International Consortium, identified previously, including international higher education faculty, business leaders from companies such as Google, Mercedes, NASA, etc., and Presidential Award Winners in the area of STEM education along with UWA faculty and local pre-service and service teachers would be invited to participate in an international summit to be held at UWA where ideas for best practices in STEM education would be exchanged.

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